Training Integration Office

1998/99

Business and Strategic Plan of the

Laboratory
Training Program

Operations

Division- & Facility-Specific Training

Training for Safety & Security

Improved Individual & Organization Performance

Workforce Development

HUMAN RESOURCES

Los Alamos
NATIONAL LABORATORY

Title	**1998/99 BUSINESS AND STRATEGIC PLAN OF THE LABORATORY TRAINING PROGRAM**
Author(s):	Training Integration Office

Los Alamos
NATIONAL LABORATORY

INTRODUCTORY NOTE

The 1998/99 Business and Strategic Plan is the second in a series of annual reports for the Laboratory Training Program. It summarizes the program's FY98 accomplishments and assessment of training needs at the Laboratory and outlines the program's FY99 strategic and tactical goals.

The Laboratory Training Program is coordinated by the Training Integration Office, which serves as a single point of contact for the Lab's decentralized training services. Line organizations from across the Laboratory deliver training focused on workforce development and Lab operations, with operations training being subdivided into safety- and security-related training and division- or facility-specific training. But although the delivery of training is decentralized, all Laboratory training meets the requirements of performance-based, graded, and systematic training.

Despite the challenge of meeting a growing demand for training in times of tighter budgets, the training program made significant progress in FY98. The Virtual Training Center offered a variety of learning and information platforms for training, a major training program around safe work practices was initiated, distance learning played a greater role in the training that was delivered, and efforts to exploit the training potential of the World Wide Web were intensified. Web-based training holds the promise of more cost-effective and timely training delivered directly to the workplace.

A key request from our training customers that became one of our tactical goals this year was that there be greater access to both instruction and training records on the Web. Training needs analyses clearly documented that workers want more self-directed learning options that can be used at the workplace and that managers, supervisors, and workers need quicker access to training records that document training requirements, progress, and worker authorization status. One of the training program's goals is to continue to enhance the Virtual Training Center on the Web to meet these needs and to enhance both the usability and versatility of the Employee Development System (EDS) for training records.

Another goal for the training program is to see that training becomes more focused on Laboratory business operations and safe work practices. To help refocus Lab training, we are increasing our efforts to assess the impact of training in the workplace and the value that training adds to programmatic efforts. All partners in the Laboratory Training Program will be working to measure the effectiveness of their instruction in the coming year.

This Business and Strategic Plan documents that while much has been accomplished in terms of providing the training required to ensure a qualified and safety-conscious workforce, training improvements are still in order, particularly in the area of on-the-job training (OJT). The steps toward making those improvements are defined in the training program's FY99 strategic and tactical goals. Our key strategic goal is to be an active partner with Laboratory organizations in knowledge management initiatives and organizational learning.

Anne Khoury
LANL Training Director

I. TRAINING OVERVIEW

Training at Los Alamos National Laboratory (LANL) is delivered by line organizations and programmatically coordinated through the Training Integration Office (TIO). Recognizing the value of creating one training program for all Lab customers, line organizations and the TIO are partnering to provide cohesive, cost-effective instruction that supports the Laboratory's mission of delivering science and technology to serve society. Figure 1 shows the programmatic alignment between major training initiatives and the Laboratory strategies they support.

Lab Strategies

Weapons School
Managing Technical Projects
MC&A
Facility-Specific Qual/Cert
Radiation Emergency Response
Rad Worker
Criticality Safety
PSAP Briefings

- **Have a strong defense core with a nuclear focus**
- **Strengthen core competencies, teaming with universities as appropriate**
- **Strengthen the Lab's multiprogram nature to strengthen core competencies**
- **Become more customer focused and market sensitive**
- **Develop business and operation excellence**
- **Partner with industry**

NTU
Education Programs for Critical Capacities
Tuition Reimbursement
Quality Management, Tools, & Certification
Tri-County Higher Education Association
Knowledge Management (VTC, mentoring, apprenticeships, success planning)
Technical Business Practices
Knowledge Transfer Tools
Motorola Alliance

Training

Property
Procurement
Security (Computer, Substance Abuse, Personnel, Physical)
Performance Management for Leaders
Leadership, Workforce, Career Development
Labwide Systems (EDS, Time & Effort, etc.)
Program Development/Project Execution
Director's Workshops
Safe Work Practices
Emergency Management
ES&H curriculum (100 courses)
New Employee Orientation
BUS & HR Academies
Computer & Software
ExMBA

Delivery Platforms
Classroom, Web, OJT, CD-ROM, Channel 10, Self-Study & Test Out, Distance Learning, Tool Kits & Job for Training, Academic Institutions

Figure 1. Alignment of Training Programs to the Laboratory's Six Mission Strategies

The Laboratory Training Program is designed to support line managers in assessing and meeting the training needs of their organizations and staff. This business and strategic plan describes the training system that underlies the Laboratory Training Program, documents the program's accomplishments for the past year, summarizes recent training needs assessment data, and presents the program's strategic and tactical goals for FY99.

Given the importance of customer-focused and institutionally aligned training at the Laboratory, this business and strategic plan will be updated annually to address new training issues and assess ongoing accomplishments.

Training Mission

The mission of the Laboratory Training Program is to improve the performance of both Lab employees and organizations. We accomplish this mission by delivering training products and services relevant to Lab operations and workforce development. Lab operations training has two components: (1) Labwide training for safety and security and (2) division- and facility-specific training (see Figure 2).
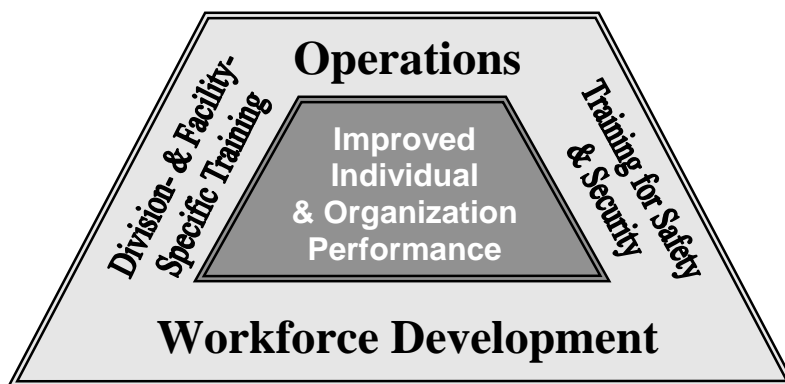

Figure 2. Mission of the Laboratory Training Program

Safety and security training covers topics such as health and safety, environmental protection, general employee training, radiation safety, safeguards and security, materials control and accountability, emergency management, computer security, and personnel security assurance. Two Laboratory divisions—Environment, Safety, and Health (ESH) and Safeguards and Security (S)—supply Labwide training for safety and security.

Division- and facility-specific training meets the diverse needs of line organizations for facility access, for job-specific qualification and certification, and for career development. This training is supplied by the Lab organizations that require it. The nuclear facilities at the Laboratory provide most of the Lab's qualification and certification training.

Workforce development training includes professional and leadership development, career development, and performance management training; education programs; new-employee orientation; computer and Labwide systems training; and business management training. The University of New Mexico (UNM) at Los Alamos provides desktop computer training, and the Computing, Information, and Communications (CIC) Division provides specialized computing and Labwide systems training. The Human Resources (HR) Division is the primary provider of institutional workforce training. UNM, the National Technological University (NTU), and other higher-education institutions such as Stanford University provide workforce education programs. The Department of Energy's National Security and Nonproliferation Institute is another training resource. The Laboratory Training Program structure is shown in Figure 3.

Training Integration Office				
Workforce Development		**Operations**		
HR Leadership & Career Development Performance Management Distance Learning Tuition Reimbursement New Employee Orientation Employee Relations Mediation Sexual Harassment	**CIC** Labwide Systems Software Secretarial Development **BUS** Budgeting Business Systems Property Procurement **UNM** PC Training Graduate Degrees	**Division- & Facility-Specific Training** Facility Access Job Duty/Functional/Equipment Qualification & Certification Career Development ESH Quality Assurance	**Safety** **ESH** Health & Safety Environmental Radiation GET Industrial Hygiene Nuclear Criticality Quality	**Security** **S** S&S MC&A Physical Security Computer Security Information Security Emergency Management Personnel Security

Figure 3. Laboratory Training Program Structure

Training Coordination

Training management involves a systems view of the process of identifying and addressing the competencies, skills, performance, and behaviors associated with ensuring that the Laboratory has the highest quality workforce with the right skills at the right place and at the right time to accomplish its mission. To provide this systems view, the Training Integration Office in HR programmatically manages the Laboratory Training Program. As the office of institutional coordination (OIC) for training, the TIO synchronizes Laboratory training responses to the Department of Energy (DOE) and University of California (UC), develops Labwide training policy, coordinates and supports Lab training teams, oversees the development and delivery of Labwide training tools, and manages the G&A training budget.

The goal of this office is to provide the "look and feel" of a single, overarching program for the Laboratory's decentralized training services—to be the point of contact for all Labwide training needs. To this end, the office and its Training Director coordinate the institutional teams, guidance and response, and tools and the distributed services related to training (see Figure 4). The office's Website gives more information on how the TIO is working to unify Laboratory training services. This Website can be accessed through the Training link on the Laboratory's internal home page.
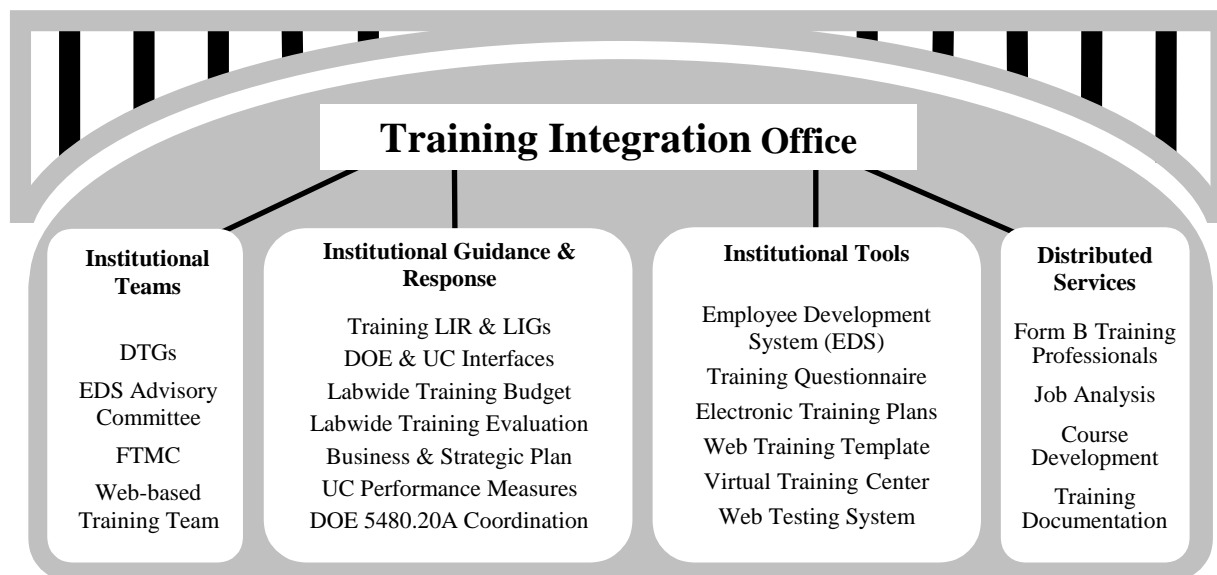
Figure 4. Training Integration Office—Bridging Training Needs at Los Alamos

Institutional Training Teams. Chartered to bring a central focus to the Lab's decentralized training operations, TIO sponsors four teams to help coordinate the diverse training products offered at the Laboratory and resolve training issues and conflicts.

- Division Training Generalists (DTGs) are training points of contact and subject matter experts who meet quarterly with the Training Director to discuss training directions, report on training accomplishments and issues, and ensure a consistent approach to training programs and initiatives within their separate divisions. Their focus is on implementing training plans, resource sharing, and continuous process and product improvement.

- The Employee Development System (EDS) Advisory Committee is composed of major users of the EDS database at the Laboratory and at Johnson Controls Northern New Mexico (JCNNM). As an advisory group, the committee helps ensure that EDS addresses the needs of its users, maintains data integrity, and follows all Laboratory, DOE, and other requirements for documenting training and maintaining training records.

- The Facility Training Managers Committee (FTMC) consists of training personnel from the Laboratory's nuclear facilities, leaders or training staff from groups that provide Labwide training, and managers of major Lab subcontractors. Chaired by the Laboratory's Training Director, the committee works to resolve cross-facility training issues and conflicts and to coordinate training decisions.

- The Web-based Training Team consists of Web experts and users who are working to coordinate a consistent look and feel for all Web-delivered training at the Laboratory. The team has developed and is implementing a series of Web-training templates that will make it easier for students to participate in on-line training. Trainers are authoring a wide variety of on-line lessons to be offered through the Virtual Training Center.

Institutional Guidance and Response. The TIO helps define the requirements for Laboratory training, interfaces with the DOE and UC on resolving training issues and sharing training resources, and coordinates a unified training budget. The office also publishes the Laboratory Training Program's annual Business and Strategic Plan and is coordinating Labwide efforts to evaluate training in terms of its impact in the workplace.

- Training requirements—An adequately trained and qualified workforce is an essential part of the Lab's Integrated Safety Management (ISM) program. To ensure a safe workforce, we must systematically identify the knowledge, skills, and abilities (KSAs) that workers need in their jobs. A Laboratory Implementing Requirements (LIR) document defines our approach to training. LIR 300.00.04—Laboratory Training: A Graded and Systematic Approach to a Qualified Workforce (July 1998)—describes the Lab's systematic approach to training (SAT) and worker qualification and/or certification requirements. This document replaces all current Laboratory standards on training and the previous Training Manual (published in 1991).

  In support of LIR 300.00.04, Laboratory Implementing Guidance (LIG) documents are being drafted. Specifically, the LIGs will summarize industry standards for systematic training and test development, on-the-job training (OJT), workforce qualification or certification, and training plans. They are supplemented by two sections in the Laboratory's *Administrative Manual*—*AM* 127 and *AM* 400—which define training policy, requirements, and processes and by the UC training performance measures (Appendixes F). Figure 5 shows the training architecture for ensuring a safe and qualified workforce.

- DOE and UC interfaces—The TIO responds to the DOE and UC on institutional training issues, audits, and reports. The office's Training Director ensures Lab compliance with the training and qualification requirements specified in DOE Orders 5480.20A and 470.1. The office manages the Training Implementation Plan (TIP) and coordinates the Training Implementation Matrices (TIMs) of institutional and nuclear facilities required by DOE. The Training Director participates in networking groups such as DOE's Training Resources and Data Exchange (TRADE), Nuclear Facilities Training Certification Program (NFTCP), and the UC Training Managers Committee. Networking opens opportunities for sharing training products and expertise. The Training Director also works with Laboratory groups to help them prepare for formal internal or external assessments, sharing DOE lessons learned and "red flags" related to training as well as the successes of previous Lab assessments. After an audit, TIO addresses findings that can be resolved by institutional action. Finally, TIO tracks progress toward meeting UC performance measures for training, completes self-assessments, and helps facilities prepare for training audits.

- Training budget—To utilize training funds more efficiently, the Training Director coordinates and allocates the G&A training budget in accord with Laboratory priorities. A centralized budget control helps prevent duplication of internal training services, funds new training initiatives, and encourages the use of training products available from other sites within the DOE complex.
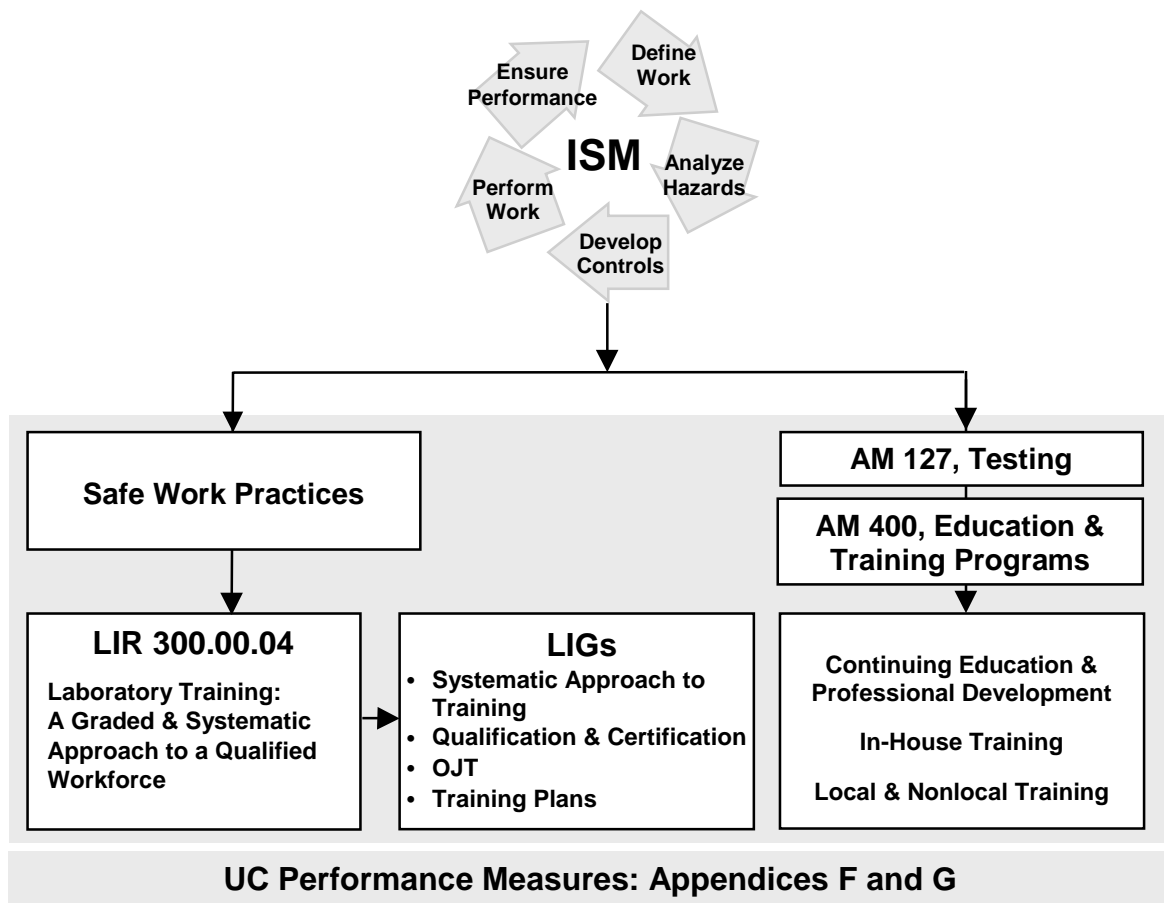
Figure 5. Training Architecture for a Safe and Qualified Workforce.

Institutional Training Tools. A number of tools are available or are being developed to track, prepare, deliver, and evaluate training at the Laboratory.

- EDS is the Laboratory's official database of training records for UC and contract employees, including the training records of major subcontractors such as JCNNM. Training data recorded in or distributed through EDS include course and employee training histories, training plans, training notifications, and various training reports.

- The LANL Training Questionnaire assists managers, training staff, and other Lab personnel in identifying required training based on job functions. The Questionnaire, linked directly to EDS and available on-line through the Virtual Training Center, forms the institutional requirements base for developing training plans for "qualified" workers (i.e., workers who must fulfill specific training requirements).

- Electronic Training Plans are a means of tracking a course or group of courses required for specific workers to perform specific job functions to check whether the training has been completed or has expired.

- The Web Training Template helps trainers provide the same "look and feel" for customers completing multiple Lab training programs. The template helps trainers gain Web development skills quickly and sets a standard for providing just-in-time, point-of-service training packages.

- The Virtual Training Center coordinates and provides easy access to training information and records. It provide two types of training reports: the first helps workers and line managers view EDS transcripts by employee name, organization, or location; the second updates the status of training plans, detailing progress towards completing required training. In combination with the Data Warehouse, a new HR tool, the Virtual Training Center allows sophisticated searches of training records.

- The Web Testing System, piloted at LANSCE, simplifies how the Lab tests employees who must be qualified for their work. The goal is to have secure tests on the Web within the next several months.

Distributed Services for Training. Training professionals are available for short- or long-term assignments through the Training Integration Office and ESH-13 to develop specific training products such as classroom training or Web-courses, to conduct table-top analyses of job content, to share performance improvement expertise, to help administer training questionnaires and training plans, and to assist with EDS data entry.

Training Organizations at the Laboratory

While the Laboratory Training Program is centrally coordinated by HR-TIO to provide unified and cost-effective services, the delivery of training is decentralized. Training organizations, often referred to as major sponsoring organizations (MSOs), are responsible for delivering training products and report to their separate line organizations. Figure 6 shows the groups and facilities that offer training at the Laboratory. Five divisions offer Labwide training; a number of divisions, program offices, and facilities offer training specific to their sites.

An on-line Laboratory training directory is part of the Virtual Training Center. The directory lists courses available at the Laboratory and gives specific information on Laboratory training personnel. A Training link on the Laboratory's internal homepage takes Lab staff directly to this information.
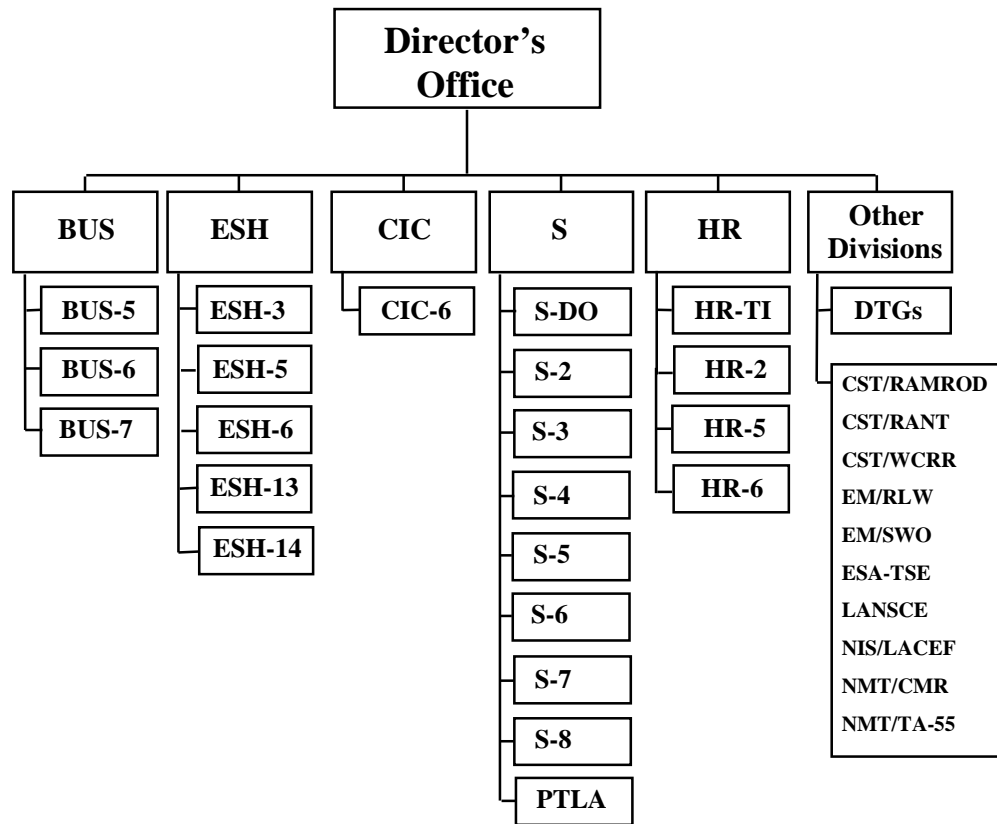
Figure 6. Organizations that Sponsor Labwide and Site-Specific Training

Training Budget

Over the past few years, training programs at Los Alamos and other DOE laboratories have experienced significant budget cuts that have affected how training is managed and delivered. This downsizing trend extends beyond the DOE complex. According to interviews with executives from Motorola, Chevron, IBM, Xerox, and similar companies, 58% of large businesses have similarly downsized their training programs, making executives uncertain that training can meet the needs of their organizations to improve performance.

In FY98, Laboratory indirect (G&A) funding for training, coordinated through the TIO, supported institutional workforce development and safety/security training programs with a little more than $7.5 million (see Figure 7). Of this sum, $3,609,000 (48%) was for workforce development, $3,175,000 (42%) for safety and security training, and $752,000 (10%) for training program management and systems (e.g., EDS and the Virtual Training Center). In addition to ongoing programs, several new initiatives were funded with the $7.5 million: training evaluation, Virtual Training Center tools, safe work practices for ISM, and EDS enhancements. These budget figures do not include funding for facility-specific training, which is covered by the facilities themselves, or for subcontractor training. In FY98, about $9 million was spent on facility-specific training, while Protection Technology Los Alamos (PTLA) alone spent $1.24 million on training.
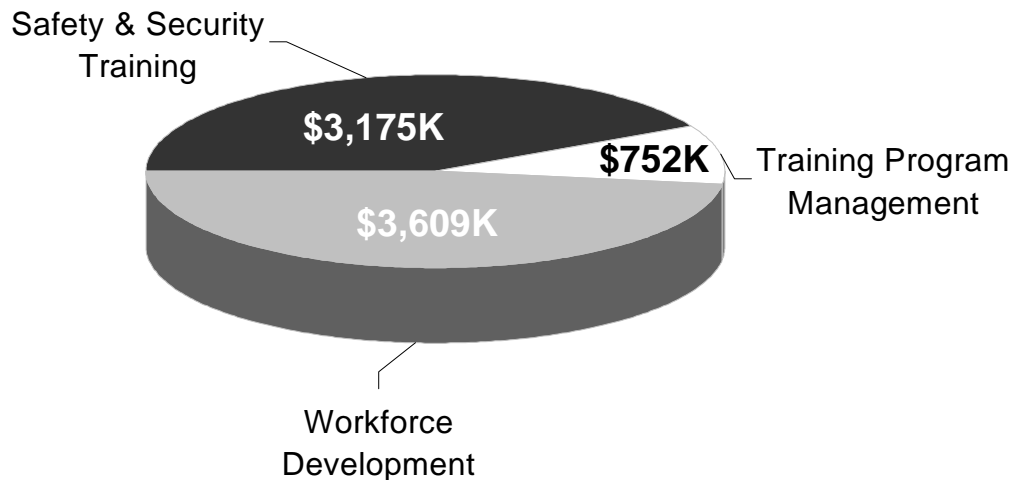
Figure 7. FY98 Labwide G&A Training Budget

DOE collects data annually on training costs within the complex. Last year's comparison of our Labwide training budget (including estimates of division- and facility-specific training costs) with training budgets at Lawrence Livermore National Laboratory (LLNL) and Sandia National Laboratories indicated that all three laboratories are quite similar. A distinguishing difference among the three facilities, however, is the greater number of nuclear facilities at Los Alamos under DOE Order 5480.20A, a factor that radically increases training costs at the facility level.

Laboratory Training Requirement

LANL training is defined as formally planned instruction to achieve the Laboratory's strategic and tactical goals, to meet specific employee needs, and to improve job performance. Training is formalized in a manner commensurate with the demands of the work involved and/or as directed and defined by the agency that oversees the work. Training requirements are defined in LIR:300.00.04, Laboratory Training: A Graded and Systematic Approach to a Qualified Workforce.

While the delivery of training is decentralized, all Laboratory training meets the standard of a performance-based, graded, and systematic approach to training. A systematic approach means that training is created through a five-step process: analysis, design, development, implementation, and evaluation. A graded approach means that as part of the analysis step, the rigor of training—simple, moderate, or comprehensive—is determined by considering the work and regulatory drivers, the impact and complexity of training, the consequences of a failure to train, available resources, and most importantly, the work that requires training. That rigor then defines requirements for the other process steps. All five steps must be followed and adequately documented (see Figure 8).
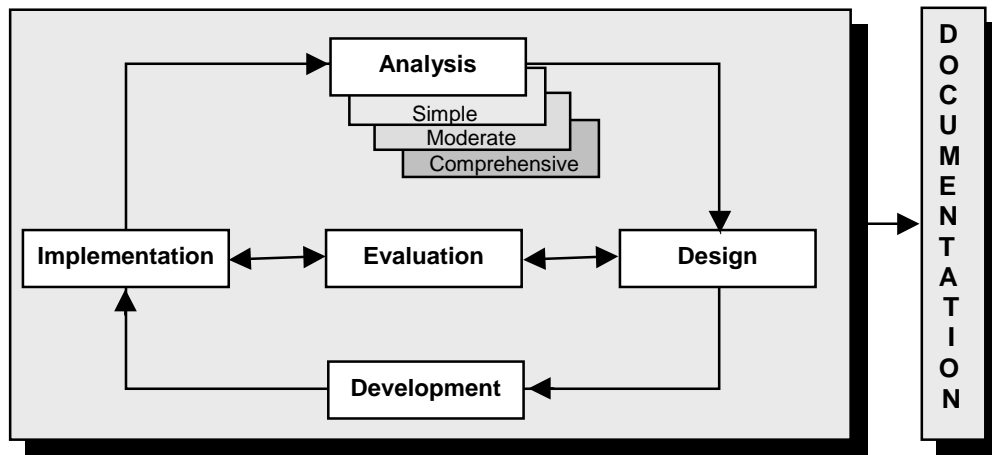
Figure 8. Graded and Systematic Approach to Training

Our graded and systematic approach ensures that quality training is developed that will maintain a qualified workforce. The Laboratory has three levels of worker authorization: worker competency, qualification, and certification.

HR-6 (T&D) maintains a Training Staff Qualification (TSQ) program to promote excellence in Laboratory workers who prepare and deliver training. Courses are available to enhance trainers' skills or to complete the formal qualification program required if their instruction leads to the qualification or certification of Laboratory workers. Last year T&D partnered with a LANL technical trainer to deliver the OJT instructor course and enrolled trainers in the DOE's National Security and Nonproliferation Institute to meet the other TSQ course requirements. T&D also established a Web site for obtaining TSQ program information, for taking the TSQ overview course, and for registering for related courses. Qualification and requalification efforts were streamlined.

Summary

The Laboratory Training Program encompasses both Labwide training that focuses on enhancing the performance of all Lab employees and organizations and division- or facility-specific training that qualifies and authorizes workers. Through partnering, training is provided by a variety of divisions, program offices, and facilities but is coordinated through the Training Integration Office. Combining decentralized delivery with centralized coordination results in customer-focused, cost-effective, and institutionally aligned training. The Virtual Training Center further unifies training services.

Figure 9 shows the big picture of the Laboratory Training Program. Each step in the overall training process involves varied training participants and tools unified through a common training infrastructure. The end product is training designed to support the Laboratory's mission of delivering science and technology to serve society.

```
┌─────────────────┐
│ Lab Strategies, │
│  Programs, and  │
│   Directions    │
└─────────────────┘
```

Identify Training Needs → Establish Training Interfaces → Develop Training Programs → Implement Training → Apply & Reinforce Training → Evaluate Success
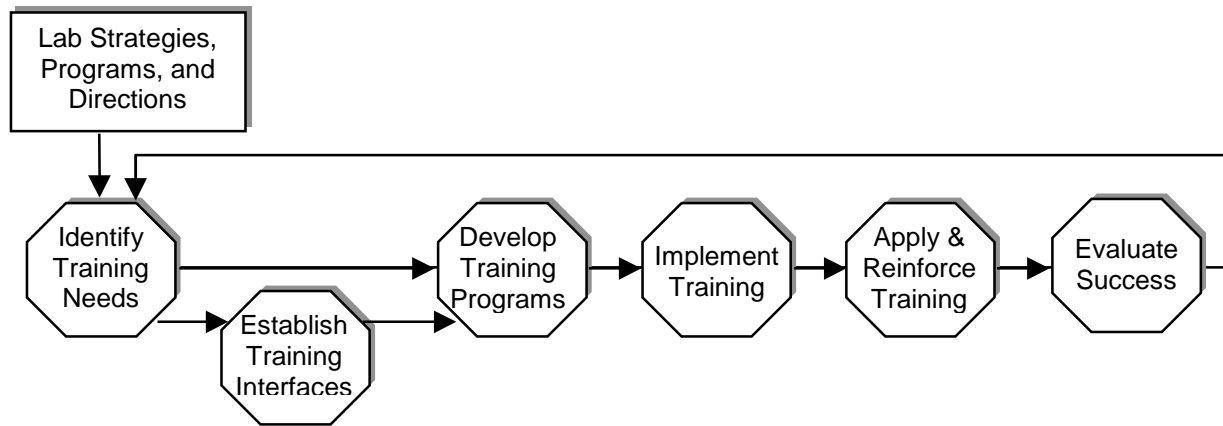
Figure 9. Big Picture of Laboratory Training

The Laboratory continues to face a number of training challenges in these times of tight budgets and understaffed initiatives, increased training accountability, and greater use of advanced learning technologies. For one, classroom training is no longer the main delivery method for cognitive, low-risk training because customers want more flexibility in scheduling their training. Second, as information technology dramatically increases, trainers, trainees, and their managers have higher expectations for instant accessibility to training. Third, no matter how large the funding cuts nor how demanding the new priorities for training, requirements still exist in a nuclear, regulated environment for a qualified workforce. Fourth, the literature shows that "best practices" in industry call for increasing training initiatives during times of change. As our workforce ages and nuclear weapons experts begin to retire, knowledge management related to maintaining a qualified workforce becomes more important. The Training Integration Office and its Laboratory training partners are working to meet these varied challenges.

II. FY98 TRAINING PROGRAM ACCOMPLISHMENTS

The American Society for Training and Development (ASTD) reports that most companies still struggle to measure, and less than half attempt to address, how training affects business results. However, the results of a 1997 survey indicate that more leading-edge companies are emphasizing the bottom line, that is, measuring how training relates to performance. The survey found that training corresponds to a worker's level of performance but that there was not enough data to claim how it changes performance. The Laboratory hopes to be able to address the issue of training effectiveness in next year's accomplishments.

The Laboratory continues to focus on training that meets core capabilities, safety culture change, nuclear training commitments, and the added requirements for a qualified workforce. The Laboratory's specialized scientists and technicians come highly skilled and work in an environment where both formal and informal learning occurs naturally. However, Laboratory positions often require that workers possess specific knowledge and experience in order to legally perform certain tasks, such as the worker authorization required by the Safe Work Practices initiative. Formal qualification/ certification programs are thus required for many positions ranging from fissionable material handlers to technical staff members and managers at nuclear facilities.

This section reports on the training accomplishments of both the Training Integration Office (TIO) and the various organizations that provide Labwide and division- or facility-specific training. It also discusses cost-saving training accomplishments.

TIO as the OIC for Training at LANL

Two years ago, the TIO was formed in HR to create a seamless training program for Lab customers. This office, responsible for training oversight, centralizes core aspects of the Laboratory Training Program and coordinates the decentralized delivery of training by varied divisions, facilities, and groups.

In 1997, the Training Director interviewed ten Laboratory directors from divisions with major training activities to ensure appropriate strategic direction and tactical business planning for Lab training. Overall, the directors supported training; however, three themes emerged from these interviews that helped focus training improvements this past year: (1) the need for alternatives to classroom training, for training that is linked to the job and has a depth of materials, and for site-based delivery of Labwide training; (2) the need for a better, quicker, and more accessible system for record keeping and for tracking safety and required training; and (3) the need to focus training and professional development on meeting organizational and operational goals and supporting evolving skills and management needs.

An on-line training survey also produced several observations that were addressed this past year. First, survey respondents were dissatisfied with EDS. In response, we improved EDS to make it more user-friendly and to have better reporting capabilities. By creating an interface with the Lab's Data Warehouse, we also gave employees wider access to training transcripts, training plans, and management reports. In response to feedback that training must be appropriately

designed and address specific needs and professional development opportunities, Lab training staff received Web templates and training on how to use them. In addition, T&D instituted Web voting for choosing which NTU classes would be offered. Finally, the survey identified the need to evaluate training more thoroughly in order to ensure that training programs are effective; as a result, measuring training effectiveness became a long-term project this year (see summary in Sec. III).

As coordinator for the Laboratory Training Program, the TIO completed several projects in FY98. These accomplishments are listed in the following table as they relate to the office's four areas of responsibility in training coordination (see Figure 4).

Coordination Responsibility	FY98 Accomplishments of the Training Integration Office
Institutional Teams	• Held meetings with DTGs to drive completion of training questionnaires and plans and to instruct on elements of the training LIR for a qualified workforce. • Held meetings with EDS users to prioritize needed upgrades and implement Data Warehouse capabilities. • Coordinated FTMC meetings to discuss issues such as Web testing, content of the training LIR, agendas of special training meetings, training plan questions, and Lab training/retraining issues. • Assisted in identifying appropriate institutional training for facility workers through use of the LANL Training Questionnaire. • Spearheaded several on-line projects focused on effective use of the Virtual Training Center for providing training information, records, and Web courses. • Developed a template for Web-delivery as an alternative to a classroom setting for low-risk training.
Institutional Guidance and Response	• Completed the UC ES&H performance measure, reaching 90 milestones to meet DOE Order 5480.20A training requirements at nine nuclear facilities (64% of the milestones were reached ahead of schedule). Created the Access database for more efficient management reports related to the order. • Published LIR 300.00.04 (Laboratory Training: A Graded and Systematic Approach to a Qualified Workforce) supporting safe work practices. • Provided the DOE and UC with Laboratory data on expenditures for training.

Coordination Responsibility	FY98 Accomplishments of the Training Integration Office cont
Institutional Guidance and Response cont	• Signed a memo of agreement with the Tri-County Higher Education Association (THEA), establishing a relationship with area colleges to support LANL training and educational needs and the school-to-work initiative. This initiative included setting up a local area network (LAN) to help administer education and job placement and supporting information technology training with a $300,000 Microsoft grant. • Completed semiannual self-assessments on training and began several training evaluation projects (see Sec. III for specifics).
Institutional Tools	• Put the Laboratory's Training Questionnaire on-line, allowing workers to identify required training and to secure management approval on-line and enabling managers to complete one questionnaire for a group of workers. • Purchased Toolbook software for designing Web training and supported training given to 47 professional trainers in using Toolbook templates. • Moved Johnson Controls Northern New Mexico (JCNNM) training records into EDS for better access and tracking. • Received a Laboratory Distinguished Performance Award for creating the Virtual Training Center. • Improved EDS's usability through links to HR's Data Warehouse.
Distributed Services	• Provided training staff to conduct job analyses and develop Web training for S Division. • Provided training plan development and records management for the Operational Readiness Review to support MST and for NMT-CMR. • Provided training management, course design/development, OJT, qual cards, and other services for ESA-TSE. • Provided job analyses for the BUS Academy. • Partnered with ESA to develop curriculum for a weapons school and to reinstitute a machinist apprenticeship program. • Started to develop a comprehensive Technical Business Practices program for the DOE weapons complex, including mechanisms for critical knowledge transfer.

Workforce Development Training

This component of Labwide training is developed and delivered by groups in HR, BUS, and CIC Divisions.

Group	FY98 Accomplishments of Workforce Development Training
BUS	• Completed 7 table-top job analyses. • Designed and/or piloted courses such as Business Operations Division Orientation, Introduction to Project Management, Participating in Projects, Intro-duction to Indirect Budgeting, Pre-TIPS Training Exercises, TIPS-Procurement Desktop, and Charging Guidelines Fundamentals.
CIC-6	• Delivered 288 sessions of 212 computer courses to nearly 3000 employees for 18,500 contact hours. • Delivered weekly presentations on computing information and resources to LANL new hires covering e-mail accounts, SmartCards, an introduction to the Web, and the Lab's Enterprise Systems. • Provided PLUS (formerly TAD) contract employees Office Skills 2000 and developed a follow-up course, Professional Skills. • Coordinated several new ASCI classes running on the ASCI Blue Mountain System to develop a core of expertise at UC schools and labs to support staff in using ASCI systems. • Presented the first secure class in the LDCC classroom after a tremendous effort from many to reach this capability for the Laboratory and, potentially, for DOE.
HR	• Developed and delivered weekly New Hire Orientation, explaining the Laboratory's mission, history, current projects, Lab-wide systems, and relationship of DOE and UC; 700 new UC employees received this training. • Delivered Sexual Harassment Prevention and mediation training. • Designed and began to implement a workforce development program and taught Essentials for Supervision, Managing Communication and Conflict, and Managing the Institution. • Implemented a single performance management system for the Lab and developed the training, resources, and tools to support this system. • Implemented the Career Development System, which includes a mentoring program, Labnet series, and comprehensive Web page with resources. • Completed the Lab's fifth annual Checkpoint Survey and Upward Appraisal Survey. • Implemented a standardized evaluation program for all T&D courses. • Expanded Advanced Technical and Management Program courses to support core competency development; designed and began implementation of the Critical Knowledge Transfer program for X Division.

Safety and Security Training

As part of Labwide operations training, safety and security training is offered by ESH and S Divisions. Two subcontractors—JCNNM and PTLA—also reported progress in training related to safety and security.

Group	FY98 Accomplishments of Safety and Security Training
ESH	• Delivered Safe Work Practices training to more than 1800 workers. Offered more than 100 courses and trained 90,000 employees, incorporating the ISM's five steps into revised and new courses.
	• Reviewed training requirements and courses with SMEs to streamline training in radiation, waste management, and the Laboratory's Hazardous Waste Permit renewal application; created and issued a self-study option for Waste Generation Overview and a self-study/test option for hazardous materials packaging and transportation: Basic Radioactive Material Transportation.
	• Upgraded ESH training services with customer input: Put ESH training registration on-line, revalidated the testing schedule, coordinated the creation of on-line testing at designated facilities, and planned the delivery of Web-based training.
	• Implemented the first radiation emergency response class in the world and helped the Lab with another electrical safety training crisis.
	• Completed a Labwide ergonomics initiative that included a video ("Personal Stories"), a course to help assess the risk of ergonomic workstation injury (Ergonomics Scorecard), an ergonomics Web page, and prevention tools such as a Manager's Resource Manual.
	• Provided short refresher lectures on criticality safety in the host group's facility.
	• Delivered three 2-day criticality safety classes to 45 Lab workers, six 3-day classes for 75 DOE and contractor personnel, and two 5-day classes to 25 non-Lab attendees.
	• Delivered certification training for quality management and quality engineering and conducted Suspect Counterfeit Awareness and Overview training for 80 workers.
	• Provided training management, course design/development, OJT, qual cards, and other services to the WCRR, RANT, and RAMROD facilities, to ESA-TSE, and to DX Division.
	• Provided distributed services to the Facility Management Program Office to create and deliver training for facility managers and for the CMMS project.

Group	FY98 Accomplishments of Safety and Security Training cont
Emergency Mgmt.	• Shared LANL-specific training, expertise, and resources including emergency response exercises with the pueblos, local counties and cities, and government emergency management and response organizations. • Delivered an introductory Crisis Negotiations Team course; taught 20 classes of Introduction to Incident Command, Coping with a Bomb Threat, and Managing LANL Emergencies; and implemented new Web-based and other alternative-platform training. • Conducted hazardous devices briefings, demonstrations, and classes at government agencies, schools, and the State District Attorney convention.
S Div.	• Enrolled 15 in the Professional Enhancement Program of DOE's National Security and Nonproliferation Institute and 113 in other Institute courses; scheduled 9 interactive television courses from the Institute; and developed a new Introduction to Safeguards & Security briefing for Program Planning & Management. • Revised Nuclear Material (NM) Handler Awareness, NM Custodian Annual Refresher for the Web, and an NM Custodian Orientation course and developed an on-line needs analysis process for all MC&A personnel. • Developed and delivered new Computer System Security Officer training. • Developed the first Classified Parts Custodian training course within DOE, trained 250 in Basic Classified Matter, presented two new sessions of the "Dice Briefings" to 630, and trained 580 in two Verona Briefings. • Published quarterly Security Bulletins and circulated new security awareness posters; registered 100 Facility Security Officers for the Annual Sandia/LANL Subcontractor Workshop. • Completed 73 PSAP briefings for 1341 workers and made the refresher course available on-line, conducted 6 Workplace Substance Abuse briefings and put the briefings on-line for 2500 workers, and delivered Violence in the Work Place on-line, all to meet personnel security training requirements. • Developed two new physical security on-line courses (Access Area Custodian and Authorized Access User) and revised the Intro to Physical Security course.
JCNNM	• Developed 6 new courses; updated 5 existing courses; delivered and coordinated 336 class sessions to 5000 learners; and processed 86 tuition reimbursement requests, disbursing $54K. • Significantly increased the percentage of completed training plans. • Developed foreman and supervisor training programs; captured many JCNNM-specific training requirements in training plans. • Implemented a new-hire/rehire process to get employees into the training process quickly.

Group	FY98 Accomplishments of Safety and Security Training cont
PTLA	• Increased training from 57,000 hours to 95,000; increased leadership, supervisory, and quality improvement training more than 100%. • Conducted training for and deployed High Mobility Multipurpose Wheeled Vehicles to significantly improve the capabilities and protection of our Special Response Team officers. • Successfully initiated Live Fire Shoot House qualification for the Special Response Team—the most difficult qualification in DOE safeguards and security training. • Opened a new and larger training center in the town site to support increased training and the PTLA training staff. • Conducted basic qualification and certified 71 new Security Police Officers in addition to completing all required refresher training and semiannual qualifications.

Division- and Facility-Specific Training

Nuclear facilities that must comply with DOE Order 5480.20A have the most visible training program commitments. The Laboratory has an integrated Training Implementation Plan (TIP) and supporting Training Implementation Matrices (TIMs) that cover the following:

• CST-25's Radioassay and Nondestructive Testing (RANT) and Waste Characterization, Reduction, and Repackaging (WCRR) facilities,

• EM's Radioactive Liquid Waste (RLW) and Solid Waste Operations (SWO) facilities,

• Engineering Sciences & Applications–Tritium Science & Engineering (ESA-TSE) facility,

• Los Alamos Neutron Science Center (LANSCE),

• NIS's Los Alamos Critical Experiments Facility (LACEF), and

• NMT's TA-55 plutonium facility and Chemistry and Metallurgy Research (CMR) facility.

Signed by DOE in October 1997, the TIP was significantly revised because of the new management of CMR and the addition of Radioactive Materials Research, Operations, and Development (RAMROD) as a nuclear facility in preparation for its operational readiness review (ORR). TIO reports quarterly on completed facility and institutional milestones and holds an annual status meeting with DOE until all commitments are met.

The implementation of DOE 5480.20A is on schedule according to commitments submitted in the TIMs. Initially, each facility's TIM had to address approximately 80 milestones, while institutionally TIO addressed 64 milestones. All institutional commitments have been met, and three nuclear facilities (TA-55, EM/SWO, and NIS/LACEF) have completed all TIM milestones for their organizations.

The effort to address almost 900 milestones in nine facilities and as an institution is considerable, with policy, procedures, processes, and training to be put in place. This year the facilities completed a total of 90 milestones: 58, or 64%, of them were achieved early (typically months in advance). No milestones were late.

Related training accomplishments are summarized in the following table.

Division or Facility	FY98 Accomplishments of Division- and Facility-Specific Training
CST-25 (RANT, WCRR, & RAMROD)	• Identified the requirements of DOE 5480.20A and specific worker qualification requirements for all current processes and completed facility and job-task analyses at RAMROD in preparation for the ORR. • Completed and released the *WCRR Facility Training Manual* to integrate training policy and procedures at the three CST facilities and provided support for the successful WCRR and RANT facility readiness assessments. • Developed and implemented a comprehensive on-the-job training program for the WCRR nuclear facility. • Prepared and submitted a TIM for RAMROD.
EM/SWO	• Purchased a procedure software package to allow the user/facility to identify all training requirements associated with written procedures and to give the EM facility manager/group leader a means of verifying training completion before actual operations begin. • Met TIM milestones ahead of schedule. • Completed training procedures for the facility.
EM/RLW	• Created a database of all RLW job-specific training plans and broke them down by individual function, hours, and dollars for budgetary and baseline purposes for both current and projected costs. • Delivered 11 (site-specific) courses—15 sessions to 210 students—for a total of 2,415 hours. • Developed site-proficiency and OJT procedures to meet FY98 milestones.
ESA-TSE	• Combined current policy documents for all three nuclear facilities under one group training program. • Put TSE's training home page on the Web. • Completed documentation for qualification and requalification programs for Weapons Engineering Tritium Facility (WETF) and Tritium Science Fabrication Facility (TSFF) operators and requalification of function tester operators at WETF in support of the weapons program.

Division or Facility	FY98 Accomplishments of Division- and Facility-Specific Training cont
LACEF	• Improved a continuing training program to include lessons learned from occurrence reports where appropriate. • Used individual training plans from EDS during resumption activities for line management to verify worker qualification for worker authorization. • Established OJT for critical assembly machine maintenance.
LANSCE	• Implemented a Web-based testing system for Labwide Rad Worker and GET. • Published a facility-specific training study guide and a study guide for users. • Added two new CBT/CD-ROM programs for training visitors to LANSCE in using the accelerator. The first, a facility-specific user training program, has decreased the time spent in training from 2.5 hours to 1 hour. The second program is a training introduction in Russian. • Successfully integrated the Accelerator Production of Tritium (APT) project into the LANSCE training program, adding about 300 workers to the number trained at LANSCE.
TA-55 & CMR	• Implemented several approved qualification programs and a certification program for fissionable material handler supervisors. • Implemented Glovebox Safety Orientation training. • Increased the delivery of institutional training at TA-55 via the Web.
MST Div.	• Fully implemented facility-specific Web-based training for the Sigma Complex, Target Fabrication Facility, and Materials Science Complex. • Implemented a facility-specific training program for occasional maintenance and craft site workers.

Cost-Saving and -Sharing Efforts

Today's rapid pace of technological change requires that workplace learning occur on a just-in-time basis when and where it's needed to create more flexible and responsive learning and performance solutions. LANL managers and workers continue to demand more-convenient and -efficient alternatives to classroom training. Response from Lab customers has been very positive to the delivery of training through printed materials and other means that allow workers to train at their work sites.

The Training Program adopted several cost-saving measures in FY98: Web-based delivery of training, video-conferencing training, and interlaboratory sharing of courses. The Security and Safeguards Division converted 70% of its training to the Web. Web conversion has reduced the

time employees spend on mandatory security training from 45 to about 15 minutes and has eliminated the time lost in traveling to such training. Since 1995, the Laboratory Training Program has also moved as much training as possible to self-study and test-out options.

The equipment and software purchased and the alliances forged with three national laboratories (Livermore, Sandia, and Oak Ridge) and with DOE's National Security and Nonproliferation Institute promise additional cost savings. Such savings will accrue as travel-for-training outlays are reduced, as training takes less time away from workplace activities, and as the time from development to delivery of training is reduced through the use of templates and established training development processes.

While the first annual All-Hands Training Day was a new expenditure in FY98, its goal was to "share information and materials and ultimately save training dollars." This event showcased successful training tools, materials, and applications of training technology developed at the Laboratory that could be utilized by others. Approximately 100 workers involved in training also took advantage of the opportunity to learn from a national expert, Dr. Geary Rummler, about the national trend of moving training in the direction of performance improvement.

We expect other training efforts (such as the new initiatives on safe work practices and workplace ergonomics) to show ultimate cost-savings and return on investment from fewer reportable workplace incidents. We also expect to track data that will document the cost savings of Web training as more knowledge-based instruction is made available on-line.

Summary

According to a 1996 ASTD report, growing competition and increased technological advances are the two primary factors that drive changes in training as work becomes more technically complex and demanding. Other factors also drove training changes at LANL during FY98:

- Developing and delivering the training needed to implement the Lab's Safe Work Practices initiative without increased funding.

- Meeting managers' and employees' needs for training and tools to support the Lab's new performance management system.

- New partnering projects with DOE.

- Completion of large projects that required qualification of workers.

Special mention should also be made of the vast training accomplished by ESH in classroom ES&H training, the variety of computer training provided by CIC with close to 300 courses delivered to meet the needs of computer users, and the efficient transfer of many security courses to the Web.

The accomplishments summarized in this section show that despite training challenges, LANL did not make the mistake of adopting short-term, quick-fix training strategies to meet the training needs of Lab workers. On the contrary, Labwide training programs delivered a greater variety of training to more customers, with courses being delivered via distance learning at a

record level. Nuclear facilities and other Lab organizations implemented new qualification and certification programs, and many traditional classroom courses were converted to other delivery methods. Many organizations delivered knowledge-based and low-risk training more efficiently on the Web. Finally, the introduction of an All-Hands Training Day brought institutional and facility training staff together in a meeting with both a learning and sharing agenda. Cost savings from these measures will be captured as part of the training evaluation system.

III. TRAINING ASSESSMENT DATA

Conducting a needs assessment is the first step in a systematic approach to training. This section provides training assessment data drawn from UC performance measures, from benchmarking outside organizations, from new efforts to evaluate training effectiveness, from DOE feedback on training, and from other training metrics.

There has also been a concerted effort this past year to share training data throughout the DOE complex. The Performance Improvement Network (PIN) links training managers from such DOE sites as Los Alamos, Livermore, Sandia, and Oak Ridge, enabling them to exchange ideas and lessons learned, provide joint critiques, share materials, communicate initiatives, and initiate joint efforts related to training. A similar network links training managers in the UC system. DOE and industry-wide benchmarking data help us assess our training activities and costs relative to those of comparable organizations. Recently, we joined 540 other corporate participants in the ASTD Benchmarking Forum to establish training trends and expenditures and to assess training's impact on performance. The TIO uses such annual comparisons to ensure that Lab training activities are in line with site programs and industry-wide standards. The office also compares Lab training with programs reported on in training and business publications and national surveys to keep our training efforts in concert with national trends.

UC Performance Measures

The Laboratory annually submits reports on the status of UC performance measures, several of which evaluate training projects. The ESH performance measure 1.4.c evaluated the implementation of DOE 5480.20A at nuclear facilities. This implementation effort involved commitments to meet approximately 900 training milestones, many completed within the last few years. Of the 90 milestones that were completed in FY98, 58 (64%) of them were achieved early, and the rest were met on time. This achievement met the requirements for the "far exceeds" gradient score.

The HR performance measure related to training (1.1.a, Evaluation of HR Systems and Processes) examined elements of workforce development and the use of participant evaluation data to enhance the design and delivery of instruction. Using a redesigned end-of-course feedback form and statistical tools to identify courses that are significantly different from other courses, HR's T&D established a priority for updating or redesigning courses and enhancing delivery techniques and instructor preparation.

Benchmarking Data

Mainstream accounting practices have not included a requirement to document investments made in learning and worker development. Only through very recent efforts by the ASTD have such data been collected. Overall, there is a significant gap between the investment that high-performance and highly technical companies make and that made by all other companies. The following discussion focuses on the training investments of highly technical, leading-edge companies.

DOE Benchmarking Data. One way to evaluate training programs is to compare their costs. Unfortunately, such costs are tracked differently from one institution to another and sometimes cannot be tracked at all (for example, there is really no way to measure the continuous learning for highly skilled workers such as those with doctorates). Also information about the cost of OJT may or may not be tracked and included in training expenditures. Nevertheless, through the effort of several training managers, last year six DOE sites compared training funds spent per worker. Brookhaven, Livermore, and Los Alamos expenditures were quire similar, despite the fact that Los Alamos has more nuclear facilities. Although Sandia's figures were somewhat lower, they reflected only institutional training costs. Oak Ridge spent a third more per worker, and Savannah River's expenditures were more than double those at LANL. To the best of our records, the Laboratory spent an average of $1,650 per worker on training, comparable to what many high-tech companies in industry spend.

National Benchmarking Data. We also evaluate Laboratory training by comparing it with industry-wide trends. According to the Office of Technology Assessment, US businesses spend more than $60 million on training annually. Training expenditure calculated as a percentage of payroll has long been a valuable benchmark. Benchmarking 55 companies' training and performance improvement activities for 2.5 million employees, the ASTD 1997 Comparative Data Report indicates that industry spent about 2.25% of its payroll on training, a quarter of a percent down from a year ago. This percentage averages to $1,526 per employee. The 1997 Human Performances Practices Survey reported a range from 2.1% of payroll to 4% for 32 firms identified as leading-edge companies.

Data collected as early as 1994 and published in *Business Week* also indicate that highly technical businesses spend more on training than industry averages. In fact, companies such as General Electric, US Robotics, and Texas Instruments spend between two to three times as much on training as the US industry average. Compared with other organizations, high-tech firms typically spend more money—sometimes up to 6% of their payroll—training more workers in lower worker-to-trainer ratios and deliver more technical and less management training. More than 25% of all training time in high-tech companies is spent on job-specific technical and computer skills and over 10% on safety training. In 1997 high-tech companies spent an average of $1,659 per worker on training (40% of that representing training staff costs) to train 87% of their workers. US industry training expenditures stayed stable over the year, with an employee-to-trainer ratio of 334:1; for high-tech companies, that ratio was 136:1. LANL's current employee-to-trainer ratio is 130:1, with a large portion of the training staff working on nuclear and high-risk projects.

The ASTD Benchmarking Forum data also indicates that an evolutionary change is taking place in how training is delivered, even though classroom instruction remains the primary delivery vehicle (70%). There is growing emphasis on combining the best aspects of both traditional and alternative training approaches. In 1996, the Forum reported that half of all internal training expenses were for technical (30%) and professional (19%) skills. The Forum also reported that the three most commonly used performance practices were employer-supported conferences (93%), annual performance reviews (92%), and individual development plans (91%); all three practices are followed at the Laboratory. Large organizations use training resource centers (76%), mentoring programs (69%), and job rotation or cross-training (76%); the Laboratory

started the Virtual Training Center last year and introduced a mentoring program as part of career development.

With the increased use of Web learning at the Laboratory, it is appropriate to benchmark how important on-line learning is to leading corporations. Boeing has reported that not only has on-line learning become a cost-effective solution to the many challenges it faces, but such training has also improved the dissemination of critical shop-floor skills and knowledge, which has, in turn, increased productivity and reduced defect rates. At Hewlett Packard Co., some 5,000 employees and third-party field engineers in North America and Europe keep abreast of fast-changing products and procedures via a Web-based training and testing program. And AT&T claims that through the use of Web training, it has brought new customer service representatives up to speed more effectively and quickly. The Lab is beginning to track the impact of its Web training.

New Efforts to Identify the Effectiveness of Training Programs

Finding better ways to track training effectiveness became a newly funded long-term project this year. Several in-depth efforts were initiated to examine how productive training is at the Laboratory. One specific focus was to ask managers how well their expectations of institutional training services were being met in terms of authorizing workers to perform specific tasks. Survey tools were created and are being used to collect data about training effectiveness. Another effort established methods to assess the effectiveness of OJT at the Lab's nuclear facilities. Our third effort focused on collecting data to identify whether our institutional services and tools (EDS, training completion status reports, electronic training plans, the training plan questionnaire, and the Virtual Training Center) are meeting training needs and functioning as designed and to determine how effective our various training programs are in meeting customer demands.

The assessment methods and tools being used to gather data on training effectiveness include the following:

- Collection of baseline data on the extent to which managers use existing training systems to ensure a qualified workforce.
- Quarterly E-mail surveys of randomly sampled workers and managers to measure satisfaction with various training programs and courses.
- Survey on Labwide implementation of the recently issued LIR (Laboratory Training: A Graded and Systematic Approach to a Qualified Workforce).
- Validation of the End-of-Class Questionnaire used for training so that the questionnaire can be used to provide predictive data on whether trainees will be able to use or implement their training.
- Training plans and training plan status reports for senior management identifying which workers need training and refresher training and who has completed training and training plans.

Assessing OJT Delivery. OJT is an essential component of an overall training program, because it is through OJT that specific job and task knowledge is communicated to workers. Through site

visits and interviews, training staff are collecting baseline data on the following: management support for OJT, availability of training staff with technical and training knowledge for OJT, appropriate match of OJT content and materials to the work environment, and OJT retention and effectiveness. Evaluation metrics are in line with the DOE 1070-94 standard, Guidelines for Evaluation of Nuclear Facility Training.

The broadest observation made to date is that many at the Laboratory perceive mentoring and OJT as synonymous, a perception that runs contrary to the DOE's requirements for formal OJT in the qualification programs at nuclear facilities. Our current concern is about inconsistencies in the development and evaluation of formal OJT. If line management supports additional work by the Lab's facility and distributed training staff, the staff can help improve OJT development and evaluation by providing assistance in writing and reviewing OJT documents and by offering more formal training in how to create OJT evaluation checklists.

DOE Feedback on Sitewide Training

As part of its emphasis on communicating lessons learned, DOE releases data on training problems and warning signals observed repeatedly at DOE sites. Published in the "Nuclear Facility Personnel Qualification Policy and Standards Program 1997 Report," this data is another benchmark used to see how Laboratory training compares with the training being conducted throughout the DOE complex.

Recurring weaknesses:

- Line and training managers do not provide sufficient support and oversight of training to correct weaknesses.

- Training analysis, course development, and revisions of training materials do not adequately reflect system or facility changes and therefore reduce the effectiveness of the training program.

- Performance evaluations do not adequately examine workers' ability to perform expected tasks; inadequate remediation practices sometimes allow unremediated trainees to return to unsupervised job duties.

Warning flags:

- Lack of interaction between line and training managers, lack of systematic training, lack of training expertise, and no ownership for the application of training to improve job performance.

- Weak self-assessments, little observation of training, and no follow-up on corrective actions by managers.

- Trainee dissatisfaction or apathy about training.

- Discontinuing training activities in times of crisis or other regulatory challenges because training staff are reassigned to nontraining tasks for extended periods.

Some of these training issues arise at LANL. At times, Laboratory training managers report frustration that their work is not among management priorities and that they are left without oversight for the training program. A few facilities undergoing great changes do not have the resources to quickly incorporate system or facility changes into training materials. However, the Laboratory has worked to see that training development involves SMEs and that performance evaluations meet high standards. While training self-assessments have been quite frank, as in other large organizations, it takes much time and energy to move forward on corrective action. Finally, while it is true that Lab training staff have been reassigned to other tasks during times of crisis, a concerted effort has been made to get back on the training track, particularly at CST facilities and at NMT's CMR facility.

TIO tracks lessons learned in training and shares this information with facilities so that they can incorporate it in their continuing training and retraining programs. TIO discusses relevant lessons learned at its monthly FTMC meetings. Such lessons are also incorporated in all training materials developed by ESH-13, which coordinates Labwide ES&H training. The lessons are used both to illustrate key training objectives and as standalone modules to reinforce specific training messages. Such lessons are drawn not only from LANL and DOE documentation but also from industrial newsletters.

Other Training Metrics

The Laboratory has a self-assessment program that examines management systems and that includes a training element. Quarterly training reports are issued on progress toward specific metrics for training under both ESH and HR performance measures. The preparation and analysis involved in both of these efforts identify specific training issues and progress on major initiatives.

Self-Assessment of Management Systems—Training. The first page of the Laboratory Self-Assessment summary report states: "There were many successes in the area of training during the past assessment period. Most notable were the Safe Work Practices training effort, development of a Training Strategic and Business Plan, and transition to Web-based training approaches. Alternately, there continues to be concerns among the training staff regarding the Laboratory's overall training organization, formality of on-the-job and facility-specific training, and the use and effectiveness of training record systems. Also an AA audit of worker health and safety revealed concern about the absence of formal safety management training of supervisors and managers."

Division Assessment of TIO. HR Division has assigned success indicators to each of its organizations. TIO leadership will be measured on the progress made in instituting the programs, services, and tools specified by three indicators: (1) Customers know the availability of training and services and view training as a coherent program; (2) training has been standardized and a graded and systematic approach to training has been implemented; and (3) customers utilize institutional training tools and receive training and training reports just in time, which reduces training costs.

Summary

The president of ASTD commented in the January 1998 issue of *Training & Development* that although the billions spent by employers on formal training in the United States seems like a substantial amount, "it is paltry compared to the need so many companies express for a workforce that can compete on the strength of its brainpower."

The Laboratory has many similarities with the companies summarized in the ASTD's 1997 Comparative Data Report:

- Through the use of advanced technology, training is becoming more centrally organized (in the areas of planning and curriculum management, design and development, delivery, and administrative support) but continues to be delivered locally.

- Integrating training with corporate objectives is being rethought as part of performance management/improvement to meet specific business goals.

- More customers want rapid development and delivery of training. With the explosive growth of the Internet, training and technology are merging to deliver just-in time, on-demand training.

- There is greater emphasis on evaluating training results in terms of improved workplace performance.

- Emphasis is shifting from training (acquiring skills for a current need) to learning (developing integrated skills and behavior that can be applied within a broad context).

Industry data continue to show that high-tech organizations tend to invest more heavily in training. The military, commercial nuclear power plants, and DOE facilities spend more on training than the norm indicated in surveys by the ASTD, International Society of Performance Improvement, and US Office of Technology. However, training expenditures at the Laboratory do not seem out of line with any of the benchmarking data for high-tech or large companies. They are also in line with training costs at other DOE sites. Considering the cost of doing business in a highly regulated DOE and nuclear environment, Laboratory training expenditures this year seem reasonable given the high degree of mandated and qualification training that must be accomplished. Training dollars were spent in areas in which they will have the most impact; for example, budget resources were shifted from other training projects to support the Lab's Safe Work Practices initiative.

The feedback from training surveys and other evaluation techniques continues to show that Lab training is viewed positively but that improvements are in order. Some improvements have already been made. In terms of ongoing and future improvements, the training assessment data reported in this section give the Training Integration Office and its Labwide training partners a solid basis for defining both strategic and tactical goals for Laboratory training. These goals are discussed in the next two sections of this plan.

IV. STRATEGIC GOALS FOR LABORATORY TRAINING

Progressive organizations champion holistic approaches to organizational learning. Peter Senge, a leading theorist at MIT's Center for Organizational Learning, combines a systems approach to training with an eclectic blend of engineering, statistics, and psychology in his "whole-organizational" model for learning. According to this model,

- everyone in an organization is responsible for learning,

- learning is crucial to modern organizational life and competitiveness,

- work can be an arena for continual personal growth,

- reflection is an important part of learning, and

- managers can be truly effective in making learning happen because they have both the organizational knowledge and the accountability for utilizing individual and organizational learning.

There is also emerging interest in knowledge management and intellectual capital so that companies can more effectively leverage the knowledge and learning of workers. With the escalating rate of workplace change, organizations must invest in learning if workers are to stay productive, to learn new skills and behaviors as well as new ways of thinking and operating, and to do more complex and subtle tasks involving problem-solving and critical thinking.

These philosophical themes are consistent with the Laboratory's training needs and have influenced the formulation of three strategic goals for the Laboratory Training Program.

1. Focus training directly on Laboratory business operations.

For the Lab to remain competitive requires proactive education and training initiatives which emphasize transferring new information that is related to business objectives and that workers can see as both useful and immediately useable. Training professionals must provide strategic performance facilitation and performance enhancement addressing critical work processes. The significant training effort this past year that supported the Lab's Safe Work Practices initiative is an example of measuring up to such demands.

For training to become a strategic business asset, the training program must continue to tighten the "relationships" between Labwide and facility- or site-specific training organizations. Such ties exist through the work of training teams like the FTMC and DTGs and through the services of distributed training professionals provided by TIO and ESH-13. The movement of training staff from institutional training to the field will increase as low-risk, knowledge-based training previously offered in classroom settings by Labwide training organizations is changed to Web-based and self-study formats.

Effective training cannot be accomplished in the vacuum of a classroom or of any single instructional product. To make training stick, instructors must integrate the training with job

tasks, thus making training an integral part of a business or mission-critical solution. The Training Program's goal of giving high priority to job- and facility-specific training is to show productivity gains and safety results. This must include an emphasis on more formalized OJT programs. The last two semiannual ESH training self-assessments identified the need for a formal OJT process for worker authorization. The standards for the delivery of OJT vary among both Lab organizations and OJT trainers. Worker authorization is an important component of Lab business operations, and training to support it must become more formalized. Managers need to champion the organization learning environment.

2. Evaluate training more thoroughly.

Management pays attention to whether employees think training is worthwhile. But the true test of the value of training should be made at employees' workstations: Does training change job performance? Are the skills learned in training being used and making a difference? In the past, training has been evaluated largely from the trainees' perspective. Success has been based on feedback received at the end of training or through course exercises, instructor observations, quizzes and tests, and performance check-outs that measure learning. Courses have then been modified in response to difficulties uncovered. In the haste to shorten training time, however, the complex process of learning—including reflection, practice to develop mastery, and connection to job tasks—must not be overlooked.

During FY98, TIO added 0.5 FTE to begin several in-depth efforts to assess both the effectiveness and usefulness of institutional training services. Surveys were designed for different audiences to collect data about the effectiveness of training: (1) Managers needed to be able to fulfill their responsibilities for authorizing work, ensuring that workers have the necessary knowledge and skills to perform specific tasks. (2) Nuclear facilities needed to establish methods to assess the effectiveness of their OJT and to improve training courses. (3) MSOs needed to ask trainees about training's value and usefulness to their jobs. (4) TIO needed to check if it is providing a quality, continuously focused Laboratory training program that meets the needs of the institution, meets DOE requirements, and justifies in a more business-results manner training expenditures. Measuring training effectiveness is vital to aligning training with Laboratory operations.

The goal is to have a validated process in place by FY 2000 for evaluating the effectiveness of training programs and then on the basis of such evaluation to

- make training program and course changes,
- expand the use of the traditional end-of-class-feedback form in order to predict if trainees can use the training they receive on the job and then use such predictive data as a way to identify courses that should be revised,
- provide supporting observational tools for managers to assess whether workers can perform trained tasks months after instruction, and
- resolve specific weaknesses in OJT, a crucial component of the training program.

Assessing training effectiveness will also entail analyzing the Lab's return on its training investment. However, the interpretation of such analyses will be cautious because some experts

suggest that trying to place dollar values on training can confuse training with unrelated management issues.

3. Exploit Web-based and advanced learning technology.

In these times of rapid change, the current and potential knowledge, skills, and abilities of our workers constitute the Lab's competitive advantage. Worker learning is vital to maintaining that advantage. The Laboratory Training Program must continue to focus on developing immediately needed learning, both for worker development and qualification, while furthering organizational learning and knowledge management. TIO has begun to facilitate this program redirection by providing resources for training technology and for the on-line Virtual Training Center, which offers a variety of learning pathways and opportunities for leveraging individual knowledge to the whole organization.

Last year, TIO consolidated all Lab training information and put it on the Web. The Virtual Training Center provides easier access to course information, on-line registration or Web-delivery links, individual and organization training reports and plans, and a wide variety of other information such as current training staff rosters, training policies, and classroom locations. It will ultimately provide Lab customers with one-stop shopping for training that is organized by learning content rather than by delivery organization. Already, however, it is changing the way training information is accessed. Two months after being launched on the Web last year, the Virtual Training Center averaged 35 hits a day; five months later, it was averaging 551 hits a day, nearly a 17-fold increase in activity.

A long-term goal of Laboratory training managers is to exploit advanced computer technology to deliver cost-effective, just-in-time training at the employee's work site. Low-risk, knowledge-based courses are being moved to the Lab's Intranet through the use of authoring software for Web training. This specialized software, ToolBook II, will deliver interactive training, track the learner's progress, test the learner's understanding, and maintain individual and group training records. ToolBook II provides customized templates that optimize the conversion of conventional instruction to Web-based formats.

Additionally, LANL training specialists and video engineers are working with innovative video-on-the-Web software developers to move instructor-led and video self-paced training to the desktop. A T&D alliance with Motorola produced a just-in-time learning (JITL) CD-ROM for the desktop. As an alternative to traditional classroom training, JITL CD-ROMs provide a high degree of interactivity to assist the learning process.

The Web's virtual learning environment offers advantages for employees such as less time away from the job, dramatically lower training travel costs, a familiar training interface, ease of use, immediate training feedback, and the ability to access the most current training information. This new training environment will support the Laboratory worker authorization process and be an arena for continual personal and organizational learning.

Yet another means to making training more convenient and less costly is the application of dramatic new types of satellite-based distance learning and video-conferencing. These real-time interactive systems, available at an increasing number of locations at the Laboratory, provide

time-sensitive information and data through virtual face-to-face communication. Such systems will allow facilities throughout the DOE complex, remote training vendors, and distant universities to provide learning opportunities to Lab employees.

Summary

The next three to five years are very important for the Laboratory Training Program, because learning is crucial if LANL as an organization is to remain competitive through qualified employees who are authorized to work. The "intellectual capital" of the Laboratory is its major resource—the basis of its competitive edge—and the training program must focus on enhancing the performance of this intellectual capital. Our key strategic goal is for training to become a business asset at the Laboratory.

Developing more-complex evaluation techniques is also an important strategic goal. Such techniques will help us identify the true impact of training and measure the value it adds to programmatic efforts. Part of measuring the impact of training is measuring its cost-effectiveness. While looking at the return on training dollars in upcoming years, however, TIO will be cautious in interpreting the meaning to such financial analyses since their value has been questioned by some training experts.

Offering training through a virtual campus on the Web is commensurate with the innovative, high-tech R&D organization that LANL is acknowledged to be. Exploiting advanced training technology should also produce long-range cost savings. Using Web technology to make training more accessible and available in the workplace may also lead to training's becoming more widely endorsed.

Robert Schank, Director of Northwestern's Institute for the Learning Sciences, has observed that there is a fundamental disbelief among successful people, typically those in management, that everyone really needs to be trained. Yet managers play a key role in initiating employee learning. In an interview about "unleashing the power of learning," John Browne, the head of British Petroleum, commented that "What determines whether learning takes place is the questions leaders ask and the way they approach what is going on. Leadership is all about catalyzing learning as well as better performance." When training is perceived by Lab managers and employees alike as an integral part of the Laboratory's capabilities, the training program will have reached its goal—to be a valued business partner in fulfilling the Laboratory's mission.

V. TACTICAL GOALS FOR LABORATORY TRAINING

The intent of the Laboratory Training Program is to deliver the right training, at the right time, to the right people, and in the right amount in order to get work done. In addition, workforce and career development initiatives address the need to ensure future workforce employability and contributions to the Lab's strategic goals. In *The Balanced Scorecard*, Kaplan and Norton view learning and innovation as critical elements in facilitating continuous improvement, promoting self-renewal, and maintaining purpose and relevance in organizations. The tactical goals presented in this section are a means of achieving the strategic training goals discussed in Sec. IV and will guide the delivery of training services and products in the coming year. Key themes are to improve data collection for training, examine external measures of training effectiveness, and partner with the DOE to evaluate the systematic approach to training.

Our tactical goals for training are listed in the following tables in the same order that our training accomplishments were given in Sec. II. We begin with tactical goals for the TIO as they relate to the training program's strategic goals. Then we move on to the tactical goals for the varied Lab organizations that offer workforce development, safety and security, and division- or facility-specific training.

Strategic Goal	FY99 Tactical Goals for the Training Integration Office
1. Focus training on Laboratory business operations.	• Manage the remaining milestones of the Laboratory's DOE 5480.20A commitments to worker training and qualification at all nuclear facilities. • Issue training guidance documents in support of the Laboratory's Integrated Safety Management program that define quality processes and methods for training. • Have all workers complete, and line managers verify, Training Questionnaires. • Incorporate the completion of Training Plans as part of the data reviewed in the performance management process. • Complete EDS system enhancements through the LANL Data Warehouse to increase Labwide accessibility to training data and reports and to meet operational demands. • Complete the incorporation of PTLA's training data into EDS so that training records from both major subcontractors can be reviewed on a daily basis when needed. • Partner with ESA to develop curriculum and materials for a LANL Weapons School and Manufacturing Academy, a machinist apprenticeship program for technicians, and a technical business practices curriculum for the nuclear weapons complex. • Help integrate decentralized training services at the Laboratory and interface with DOE and UC on training issues. • Partner with Lab organizations, regional educational groups, and other DOE sites to maximize training resources, leverage training expertise, and reduce training duplication.

Strategic Goal	FY99 Tactical Goals for the Training Integration Office cont
2. Evaluate training more thoroughly.	• Collect data to track customer satisfaction with training, learning achievement, and the completion of qualification requirements. • Develop better measures for evaluating training effectiveness at the work site and training's impact on Laboratory business. • Capture cost savings from new initiatives such as Web-based delivery of training and interlaboratory sharing of training.
3. Exploit Web-based and advanced learning technology.	• Develop a searchable on-line catalog of all Laboratory training and a linked on-line voting mechanism that allows potential trainees/groups to communicate their training needs to sponsoring training organizations. • Expand our Web-delivery system to allow workers at all DOE sites to take appropriate LANL-sponsored Web-based training. • Double the number of Web-delivered courses. • Use new Web tracking software to (1) track employees' progress in training, (2) identify learner problems and successes in training to improve training programs, (3) deliver and grade quizzes and tests, (4) compare training reports and assessment results with regulatory standards to inform managers of workers' compliance status, and (5) maintain Web-based training records. • Exploit educational delivery technologies (e.g., the Internet, Labnet Channel 10, interactive satellite downlinks, two-way video-conferencing, microwave instructional television, CD-ROMs, and computer-based training) to deliver just-in-time training to the customer.

Group	FY99 Tactical Goals for Workforce Development Training
BUS	• Begin development of training programs based on the seven table-top job analyses completed. • Complete courses that are in the development process and begin course delivery on a regular basis. • Roll out the BUS Academy Website and encourage use of Web-based BUS training on Office 97.
CIC-6	• Complete software engineering, project management, and personal software process classes and schedule lectures from ASCI code development teams in CIC and X Divisions. • Upgrade the LDCC classrooms, including the Sun LX and SM-200 classrooms, replace the SGI Indys, and upgrade Pentium Pro 200s and P180. • Introduce three major software packages—CMMS, PeopleSoft, Tips—and use ToolBook II to develop CBT courses.

Group	FY99 Tactical Goals for Workforce Development Training cont
HR	• Complete evaluation and implementation of the performance management system. • Develop and provide a comprehensive and integrated approach to leadership development that supports managers in achieving their organizational goals. • Continue implementation of the Workforce Development Program with emphasis on addressing gaps identified by workforce planning. • Continue support for the implementation, evaluation, and integration of the career development and performance management systems. • Develop tools, resources, and methodologies to assist divisions and groups in addressing organizational needs. • Identify training and education needed to help the Lab maintain its core competencies. • Continue to offer new-hire orientation and courses focused on improving employee relations (e.g., mediation training).

Group	FY99 Tactical Goals for Safety and Security Training
ESH	• Work with health and safety subject matter experts in analyzing Laboratory ES&H LPRs, LIRs, and LIGs to streamline required training. • Incorporate the Lab's five-step ISM process into courses that will be revised in FY99. • Implement on-line testing in White Rock; provide head phones for employees with hearing disabilities who attend training; budget permitting, develop a HAZWOPER supervisor class. • Implement (budget permitting) Web-based training for health and safety self-study classes and integrate the ESH manager classes into a coherent structure. • Support four to seven workers in preparing to take the certified environmental trainer (CET) exam. • Expand the scope of the instructor coaching program. • Develop a Web-based version of the Ergonomics Scorecard course, make an ergonomic resource room available for Lab workers to try out ergonomic furniture and tools, and complete computer- and Web-based ergonomics training. • Deliver courses for certification in mechanical inspection and in quality management, engineering, and auditing. • Continue to deliver a 2-day course and short refresher in criticality training for LANL personnel and 3- and 5-day courses for DOE and its contractors. • Develop a new, supplementary 5-day course on nuclear criticality to fulfill a commitment made in response to DNFSB Recommendation 97-2.

Group	FY99 Tactical Goals for Safety and Security Training cont
Emergency Mgmt.	• Continue to provide training for the Hazardous Devices Team (HDT) and Crisis Negotiations Team (CNT), keeping them abreast of the most current information in their fields so they can provide the best possible service/protection for the Laboratory. • Expand outreach efforts with the pueblos and surrounding communities. • Continue to share training resources and information with off-site organizations at the federal and state (FEMA, DOE, New Mexico Department of Public Safety, U.S. Forest Service), regional, and local levels. • Provide continued Labwide training in the areas of Bomb Threat Awareness, Incident Command, and Emergency Management.
S Div.	• List all S&S training through the Virtual Training Center, revise and update the *Safeguards & Security Training Manual*, and continue coordination of career development for S&S professionals through DOE's National Security and Nonproliferation Institute. • Put the MC&A needs analysis survey on-line to identify training requirements and curriculum at TA-18, CMR, and TA-55 and develop or revise materials control and accountability (MC&A) training. • Revise on-line 1998 Annual Security Refresher Briefing, Classified Document/Parts Custodian, 1998 Computer Security Refresher, Physical Security, Authorized Access Area User, and Access Area Custodian training. • Develop and implement an on-line Classified Handling Awareness course and implement a revised Physical Security course and Organizational S&S Officer training. • Develop a "Training Records/Documents Archive System" that will electronically archive all information connected with a training program.
JCNNM	• Develop and implement training program procedures and a process for worker qualification. • Establish and conduct a process to evaluate training effectiveness.
PTLA	• Purchase, install, and operate a Close Quarter Battle Simulator (CQBS) to enable the Special Response Teams to conduct required training and qualifications. • Transition PTLA training records to EDS. • Build and operate a 400-yard range for the M79 Grenade Launcher at the TA-72 Live Fire Range. • Transition five knowledge-based training classes from lecture format to computer/Web-based instruction on PTLA's or LANL's intranet. • Accomplish all priority 1, 2, and 3 training requirements identified in PTLA's FY99 Annual Training Plan by conducting a total of 90,000 hours of training.

Division or Facility	FY99 Tactical Goals for Division- and Facility-Specific Training
CST-25	• Assist in qualifying additional workers for WRR job functions. • Complete reexaminations for all procedure training. • Demonstrate training program performance and compliance by successfully meeting criteria in the anticipated DOE, LANL, and Transuranic Waste Characterization/ Certification Program audits.
EM/SWO	• Implement a two-year plan to increase job-specific OJT, decrease off-site training, and improve the effectiveness of job training.
EM/RLW	• Continue to implement OJT and site-proficiency procedural training. • Create a site-specific training video for facility employees and visitors. • Link the RLW procedure database with EDS to reduce double-entries. • Consolidate all SOPs into one hazard identification procedure for use with all on-site TA-50-1 employees (tenants and contractors) that will replace our training video required before badge access is granted.
ESA-TSE	• Develop training materials for facility requalification, mechanical technicians, and operator/function tester operators at WETF. • Prepare for the startup of the Neutron Tube Target Loading project at TA-16. • Streamline training programs across all three nuclear facilities so documents have consistent look and implementation. • Extend use of EDS/Data Warehouse in TSE to contain facility-specific training plans that lend themselves to easy verification of worker authorization in support of SWP.
LACEF	• Continue to improve and expand the LACEF test question bank and develop a formal scoring system for oral testing. • Conduct the next cycle of operator certification training.
LANSCE	• Develop and implement additional training tools for foreign visitors, including a training introduction in Japanese and quick reference cards in at least two languages. • Integrate a Web-based LANSCE safe work practices system with current OJT program.

Division or Facility	FY99 Tactical Goals for Division- and Facility-Specific Training cont
TA-55 & CMR	• Complete analysis of CMR needs and begin course development for facility-specific training and required qualification and certification programs. • Convert portions of TA-55 self-paced training into Web pages. • Implement a procedure writing course. • Improve OJT procedure and instructor/evaluator course.
MST Div.	• Develop Web-based facility-specific training, including walk-around orientation, for the Beryllium Technology Facility.

Summary

A variety of training assessments—needs analyses, input from Laboratory leaders, projected requirements, benchmarking data, customer feedback, and training evaluations—have suggested directions for FY99 training. Strategic training goals have helped organizations that offer both Labwide and facility-specific training to identify initiatives that will support Laboratory operations, deliver training more efficiently, and develop a qualified workforce. For example, during the past year, T&D moved from offering a wide-ranging, comprehensive training curriculum to providing fewer programs that are more closely tied to institutional priorities in HR.

The FY99 tactical goals outlined in this section will help execute key organizational strategies, decisions, and change; teach new technical skills and techniques; implement new polices, regulations, standards, and procedures; and authorize workers through qualification programs that ensure that workers can competently execute their job assignments. The involvement of subject matter experts in such training will ensure that training content is appropriate, correct, and targeted to the right audience. The continuing efforts of training managers will focus on delivering more Web-based training.

Support for training by the Lab's senior management reinforces the commonly held belief that a well-trained worker will be a productive worker. Managers recognize that learning skills are required in order to respond flexibly and quickly to technical and organizational change; make continuous improvements in quality and efficiency, and develop new technologies, products, and services. As Ken Blanchard has observed, training has a history of promoting knowledge and positive work attitudes but now the challenge is to tie learning to changes in behavior, on-the-job performance, and bottom-line operational results. We shall continue to gear Lab training toward improving the Laboratory's business operations.

VI. CONCLUSIONS

The Training Integration Office is partnering with organizations across the Laboratory to integrate training activities with larger institutional objectives and to deliver training products relevant to Lab business operations and worker development. Results of our efforts to reengineer training include providing on-demand, just-in-time, and just-enough training resources that may or may not resemble traditional learning experiences. Our focus will continue to be on developing performance-centered training platforms such as T&D's recent JITL CD-ROM.

Responding to a variety of internal assessments and in keeping with training trends outside the Laboratory, we are striving to move training from the classroom to the desktop, making both training opportunities and records more widely accessible on the Web. Web-based training offers the advantages of wider access, easier updating, and a common user interface for training offered throughout the Laboratory. Continued enhancements to the EDS database and the Virtual Training Center will make more training data and reports available in a wider variety of formats to both managers and employees, helping them pinpoint who needs what training when. We are also striving to evaluate Lab training more thoroughly by measuring its effectiveness in terms of on-the-job impact. Such measurements will help ensure that training is focused on areas that add value in terms of furthering programmatic goals at the Laboratory.

Finally, while orchestrating these changes toward more effective, customer-focused, technologically advanced, and institutionally aligned training, all partners in the Laboratory Training Program are striving to make more efficient use of limited resources. Like many training organizations within the DOE complex and nationwide, we face the challenge of achieving more with less. Our success in all of these endeavors will be measured a year from now when we reassess the accomplishments and cost savings of the Laboratory Training Program.

TIO embraces the message delivered by the head of British Petroleum, John Browne: "Learning is at the heart of a company's ability to adapt to a rapidly changing environment." As training becomes more cost-effective, automates its record keeping, and meets its strategic and tactical goals, it should finally become a valued partner in achieving the Laboratory's mission. New knowledge and skills are no longer a value-added bonus but an essential factor in meeting the Laboratory's mission.